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A chronobiologist makes sense of circadian dysfunction in illness

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higher-ranking males mated more often with fertile females, but there was a twist. Lower-ranked males were more successful when their mothers were around.

When every male's mother was present, the alpha bonobo's share of matings with fertile females declined from 41% to a mere 25%. The authors propose several possible reasons for this influence, one of which was clear to see: mothers were spotted helping to fight off their sons' sexual competitors.

ATMOSPHERIC CHEMISTRY

A wandering ozone hole

Geophys. Res. Lett. doi:10.1029/2010GL043699 (2010)
The edge of the Antarctic ozone hole shifted and then stalled over the southern tip of South America for nearly three weeks in November 2009, exposing people in Tierra del Fuego to double the normal levels of ultraviolet radiation for the area. The anomaly provided an opportunity to test monitoring systems for ozone and ultraviolet radiation during extreme conditions.

Jos de Laat of the Royal Netherlands Meteorological Institute in de Bilt and his colleagues found that ozone and ultraviolet radiation measurements from three ground stations lined up well with ozone data from a sensor aboard the European Space Agency's Envisat satellite. Algorithms for calculating the 'ultraviolet radiation index' from satellite data were also able to produce correct values for the period.

EVOLUTIONARY BIOLOGY

Ginormous genomes

PLoS Genet. 6, e1001080 (2010)
Why does genome size vary so widely among species — even among those of the same family? Population size is one proposed answer: mutations that increase genome size are harmful, and selection would more efficiently weed out such mutations in species with a higher head count.

According to Kenneth Whitney of Rice University in Houston, Texas, and Theodore Garland at the University of California, Riverside, the original analysis of 30 species that underlies this idea may be flawed. When the duo reanalysed the data — this time accounting for the evolutionary relationships between species, because shared history may mean similar population and genome sizes — they found no clear link between population size and genome size.

MARINE BIOLOGY

Charismatic carbon

PLoS One 5, e12444 (2010)

Just as trees store carbon on land, the giant bodies of whales lock up carbon at sea. But a century of whaling has reduced the numbers of many species — including blue, humpback and bowhead whales — by more than 75%.

Andrew Pershing at the University of Maine in Orono and his colleagues estimate that pre-industrial whale populations held almost 9 million tonnes more carbon than do today's whales, equivalent to more than 110,000 hectares of forest. That carbon hasn't just shifted around in the food chain, the researchers say, because whales store more carbon than smaller animals, such as penguins, given the same amount of food. Helping to rebuild whale numbers could provide the world with a blubbery carbon sink.



PLANETARY SCIENCE

Weighing the planets

Astrophys. J. 720, L201–L205 (2010)

Accurate weights for nearby planets have been calculated from observations of the effect their gravity has on passing spacecraft. But that requires a spacecraft and gives the mass of only a planet, not the planet and its moons.

David Champion of the Australia Telescope National Facility in Epping, New South Wales, and his colleagues show that radio pulses emitted by a type of neutron star called a pulsar can provide similar information. Shifts in the alignment of masses in the Solar System affect the arrival times of these pulses at observatories. Using at least ten years' worth of measurements, and focusing on variations in signals from four pulsars, the authors were able to measure the masses of all of the planets (plus moons), except Uranus and Neptune, at up to seven-decimal accuracy — comparable to the best results from spacecraft fly-bys. With another ten years' worth of data, they hope to refine that even further.

NAT. HIST. MUS. (LOND.)

JOURNAL CLUB

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A chronobiologist makes sense of circadian dysfunction in illness.

When my grandfather was dying of cancer, he found himself up most nights with my grandmother, who was succumbing to Alzheimer's disease. A nasty side effect of some neurodegenerative diseases is the loss of a regular sleep-wake cycle. Our circadian biological clock is manifest in every one of our cells, which show daily rhythms in gene expression; cellular clocks synchronise to become organ clocks, and these determine the whole organism clock.

When Jennifer Morton at the University of Cambridge, UK, and her colleagues investigated the timing of gene expression in tissues from mouse models of Huntington's disease, they found daily ups and downs — at least in some genes — that were similar to those in healthy animals (E. Maywood *et al.* *J. Neurosci.* 30, 10199–10204; 2010). But the mice slept and woke at random even when exposed to regular light-dark cycles. Interestingly, the researchers found that rhythmic behaviour could be restored to Huntington's mice through another stimulus — feeding the animals at a specific time of day.

I am intrigued by this work because it highlights the relevance of chronobiology to neurodegenerative disease. The authors show that in Huntington's, the disease disrupts behavioural manifestation of the clock; in a bizarre feedback, the progression of the disease may be exacerbated by clock dysfunction through disruption in expression of a subset of clock-controlled genes.

This work also reminds me that non-photic clock stimuli are powerful tools and can be used to set the clock when light cannot. These alternatives will be important as we try to keep the clock synchronized in our increasingly unnatural modern environment — and as we try to improve the health and quality of life for both grandmothers and grandfathers.

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